

REMARKS

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants have amended claim 4 to recite a polyvinyl "acetal" resin; and have amended each of claims 4 and 8 to recite, in the first recitation thereof, "the" polyvinyl acetal resin. In light of the amendments to claims 4 and 8, it is respectfully submitted that the objection to these claims as set forth in Item 2 on page 2 of the Office Action mailed March 5, 2003, is moot; and that the required correction has been made.

Applicants have amended dependencies of claims 12-14 and 20 such that these claims are only dependent on claims that were allowed in the Office Action mailed March 5, 2003. In light of amendments in dependency of claims 12-14 and 20, Applicants are adding new claims 24-27 to the application. Claims 24-27 respectively set forth subject matter expressly recited in claims 12-14 and 20, but are dependent on any one of claims 1 and 3-6, or on claim 1 or 3, claims that were rejected in the Office Action mailed March 5, 2003. Thus, the scope of claims 12-14 and 20, and claims 24-27, is the same as the scope of previously considered claims 12-14 and 20.

In addition to claims 24-27, Applicants are adding new claims 22 and 23 to the application. Claims 22 and 23, each dependent on claim 1 or 3, respectively recites that the adhesive composition is adapted for adhering the metal foil to a substrate, and recites that the adhesive composition is adapted for adhering a copper foil of a copper clad laminated wiring board to a prepreg of the wiring board.

The Examiner is thanked for the indicated allowance of claims 7-14 and 20,

as set forth in Item 8 on pages 3 and 4 of the Office Action mailed March 5, 2003. In view of present amendments to claim 8, it is respectfully submitted that claim 8, dependent on allowed claim 7, should now also clearly be allowed.

Moreover, in light of amendments to claims 12-14 and 20, these claims also should clearly be allowed.

As for the remaining claims in the application, it is respectfully submitted that the subject matter of these claims patentably distinguish over the teachings of the reference as applied by the Examiner in the Office Action mailed March 5, 2003, that is, the teachings of U.S. Patent No. 3,380,831 to Cohen, et al., under the provisions of 35 USC §102 and 35 USC §103.

It is respectfully submitted that this reference as applied by the Examiner would have neither taught nor would have suggested such an adhesive composition for a metal foil as in the present claims, including the specified components, and wherein when a tracking resistance test as recited in claim 1 is performed, a specified adhesive layer of the adhesive composition dissolves out for the first time when 5 drops or more of the electrolyte are dropped thereon. See claim 1.

Moreover, this reference as applied by the Examiner would have neither taught nor would have suggested such an adhesive composition as in the present claims, containing the recited components, and wherein in a thermogravimetric analysis after curing, the adhesive composition has a 5% weight loss temperature of at least 290°C and has a carbon residual ratio at 650°C of the cured adhesive composition that is less than 1% by weight. See claim 3.

In addition, it is respectfully submitted that this reference would have neither

disclosed nor would have suggested the other aspects of the present invention as in the remaining rejected/newly added claims, having the features discussed in connection with claims 1 and 3, and further including (but not limited to) wherein the composition includes at least one thermosetting resin which does not react with the polyvinyl acetal resin and which is compatible with the polyvinyl acetal resin (see claim 4), the composition including at least one thermosetting resin which does not have an aromatic ring (see claim 5); and/or wherein the at least one of the polyfunctional acrylate compound and the polyfunctional methacrylate compound has two or more acryloyl groups or methacryloyl groups in the molecule (see claim 6; note also claim 19); and/or wherein the composition further includes at least one filler selected from the group thereof recited in claim 24; and/or wherein the composition further includes at least one of an antioxidant, a metal scavenger and a lubricant (see claim 25); and/or wherein the composition also includes a curing agent for the polyfunctional acrylate compound or methacrylate compound (see claim 27); and/or the adhesive-coated metal foil as in claim 26; and/or the formulation weight ratio of polyvinyl acetal resin to thermosetting resin as in claim 21; and/or the adhesive composition adapted for adhering the metal foil to a substrate (see claim 22), more particularly for adhering a copper foil of a copper clad laminated wiring board to a prepreg of the wiring board (see claim 23).

The present invention is directed to an adhesive composition for a metal foil for a printed wiring board of an electric or electronic equipment, and uses thereof.

As electronic equipment becomes smaller in size and has increased functions, a printed wiring board to be used therein is required to be of a high density

and fine wiring pattern. Due thereto, required levels of solder heat resistance and copper foil-peel resistance is becoming higher; and, also, for electronic equipment to which a high voltage is applied, such as a television set, tracking resistance is required. Tracking is a phenomenon in which a carbonized conducting path or a tracking path is, under the present circumstances, disadvantageously formed between portions having a difference in voltage on a surface of an insulating material.

Various adhesive compositions have been proposed in order, for example, to improve various properties of the adhesive; however, such adhesive compositions are unsatisfactory in at least one aspect of adhesiveness between a wiring pattern (for example, a wiring pattern formed from copper foil) and a substrate (for example, a substrate of a printed wiring board); solder heat resistance, peel resistance, tracking resistance, etc.

Against this background, Applicants provide an adhesive composition having good properties of heat resistance, peel resistance, etc., and which also has improved and satisfactory tracking resistance. Applicants have found that by utilizing an adhesive composition containing at least a polyvinyl acetal resin, a thermosetting resin and at least one of a polyfunctional acrylate compound and a polyfunctional methacrylate compound, having properties as recited in claim 1 or 3, objectives of the present invention are achieved. For example, good tracking resistance and adhesiveness, as well as solder heat and peel resistance, can be obtained. Note, for example, the results shown in Tables 1-4 on pages 21, 24, 26 and 28, of Applicants' specification.

It is respectfully submitted that the properties set forth in claims 1 and 3 will not inherently be obtained from compositions including various of the specified components set forth in claims 1 and 3. In this regard, attention is directed to Tables 1-3 respectively on pages 21, 24 and 26 of Applicants' specification. Even when thermosetting resins mentioned, e.g., in Cohen, et al., such as the phenol resin and the melamine resin, are used, the recited properties of claims 1 and 3 will not necessarily be obtained. Note Comparative Examples 1-6 in Tables 1-3. It is respectfully submitted that Applicants have found specific compositions with specific properties, achieving the objectives according to the present invention.

Cohen, et al. discloses photopolymerizable compositions for a thermal transfer process, including a thermoplastic macromolecular organic polymer which is solid at 50°C; at least one monomer as discussed in the following; an addition polymerization initiator activatable by actinic radiation; and, if desired, an addition polymerization inhibitor. The monomer to be incorporated in the photopolymerizable composition are described in this patent as having increased molecular size and cross-sectional area as compared with previously used monomers, and are described as being prepared by condensing ethylene or propylene oxides with tri- or polyhydric low molecular weight alcohols resulting in a branched polyol having repeating ether units and a large cross-sectional area, with addition polymerizable compounds then being made by esterification of branched polyols with acrylic or methacrylic acid. Note column 8, line 70 to column 9, line 5, together with column 3, lines 1-14. This patent further discloses that in addition to a plasticizer which can be added to the thermoplastic polymer constituent of the composition, there can be

added non-thermoplastic polymeric compounds to give certain desirable characteristics, for example, to improve adhesion to a base support, adhesion to a receptor support on transfer, wear properties, chemical inertness, etc. Suitable non-thermoplastic polymeric compounds include polyvinyl alcohol, cellulose, anhydrous gelatin, phenolic resins and melamine-formaldehyde resins. See column 10, lines 11-20.

It is noted that Cohen, et al. discloses various "non-thermoplastic" polymeric compounds which can be added to the photopolymerizable composition of Cohen, et al. It is respectfully submitted that such disclosure of various polymeric compounds to, inter alia, improve adhesion to a base support, or adhesion to a receptor support on transfer would have neither taught nor would have suggested the adhesive composition for a metal foil as in the present claims, particularly such composition having properties as recited therein; and would have neither taught nor would have suggested the unexpectedly better results achieved by the present invention as an adhesive composition for a metal foil, particularly for adhering a metal foil to a substrate and especially for adhering a copper foil of a copper clad laminated wiring board to a prepreg of the wiring board, as achieved by the present invention and discussed previously.

While Cohen, et al. refers to "non-thermoplastic polymeric compounds" which may optionally be included in the composition, such compounds are not necessarily thermosetting polymeric compounds; and, moreover, clearly would not necessarily achieve compositions with properties as recited in the present claims.

The contention by the Examiner that Cohen, et al. anticipates the presently

claimed invention "with the understanding that the compositional constituents of [Cohen, et al.] overlap in scope with the compositional constituents, as claimed", is respectfully traversed. It is respectfully submitted that Cohen, et al. does not provide guidance leading to the specific compositions as in the present claims, much less such compositions with properties as in the present claims.

The contention by the Examiner that it would be expected that the composition of Cohen, et al. "would necessarily possess such [claimed property recitations] since the adhesive composition of [Cohen, et al.] is essentially the same as the claimed adhesive composition" is respectfully traversed. Cohen, et al. discloses photopolymerizable compositions and elements containing a number of components as set forth in the paragraph bridging columns 8 and 9, which includes, for example, a thermoplastic macromolecular organic polymer. It is respectfully submitted that the Examiner has not established that all photopolymerizable compositions of Cohen, et al., much less those containing optional components such as phenolic resins and melamine-formaldehyde resins, would necessarily have the same properties as recited in the present claims, including being an adhesive composition.

In any event, it is respectfully submitted that Applicants have satisfied their burden in showing that, for example, photopolymerizable compositions corresponding to Cohen, et al. would not necessarily have the same properties as the presently claimed adhesive composition. In this regard, attention is again respectfully directed to the Comparative Examples 1-6 shown in Tables 1, 2 and 3 respectively on pages 21, 24 and 26 of Applicants' specification. It is respectfully

submitted that these Tables, describing compositions including non-thermoplastic polymeric compounds referred to in column 10 of Cohen, et al., shows that compositions corresponding to Cohen, et al. would not necessarily have properties recited in the present claims.

In view of the foregoing comments and amendments, reconsideration and allowance of all claims remaining in the application are respectfully requested.

Attached hereto is a marked-up version of the changes made to the claims by the current Amendment. The changes are shown on the attachment captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE".

To the extent necessary, Applicants petition for an extension of time under 37 CFR §1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to the Deposit Account No. 01-2135 (Case No. 511.37656X00) and please credit any excess fees to such Deposit Account.

Respectfully submitted,

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A handwritten signature in dark ink, appearing to read "William I. Solomon", with a long horizontal flourish extending to the right.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE".

4. (Four Times Amended) The adhesive composition for a metal foil according to Claim 3, wherein the thermosetting resin does not react with [a] the polyvinyl [acetyl] acetal resin and is compatible with the polyvinyl [acetyl] acetal resin.

8. (Amended) The adhesive composition for a metal foil according to Claim 7, wherein said composition comprises 20 to 500 parts by weight of a polyfunctional acrylate compound or a polyfunctional methacrylate compound having two or more acryloyl groups or methacryloyl groups in the molecule and 5 to 100 parts by weight of an epoxy resin based on 100 parts by weight of [a] the polyvinyl acetal resin

12. (Twice Amended) The adhesive composition for a metal foil according to any one of Claims [1 and 3-11] 7-11, wherein said composition further comprises at least one filler selected from the group consisting of silica, alumina, aluminum hydroxide, magnesium hydroxide, talc and organic filler.

13. (Three Times Amended) The adhesive composition for a metal foil according to any one of Claims [1 and 3-11] 7-11, wherein said composition further comprises at least one of an antioxidant, a metal scavenger and a lubricant.

14. (Twice Amended) An adhesive-coated metal foil which is obtained by

coating the adhesive composition for a metal foil according to any one of Claims [1 and 3-11] 7-11, as a varnish on one of the surfaces of the metal foil and drying.

20. (Twice Amended) The adhesive composition for a metal foil according to Claim [1, 3 or] 7, further comprising a curing agent for the at least one of the polyfunctional acrylate compound and the polyfunctional methacrylate compound.